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(56) Documents cited
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(58) Field of search
UK CL (Edition J) A1E EAKX
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(54) Propagation tray

(57) A propagation tray for growing and transporting plants to be planted in rows by a planting machine, comprises rows of plant cells, each plant cell being generally triangular in profile, as seen in plan view. The triangular profile strongly inhibits spiralling of the plant roots. The triangular cells are arranged in an overlapping row configuration whereby utilisation of space within the tray is maximised. The cells have relatively open bottoms whereby air pruning occurs. The trays have extended skirts which improve strength and handling.

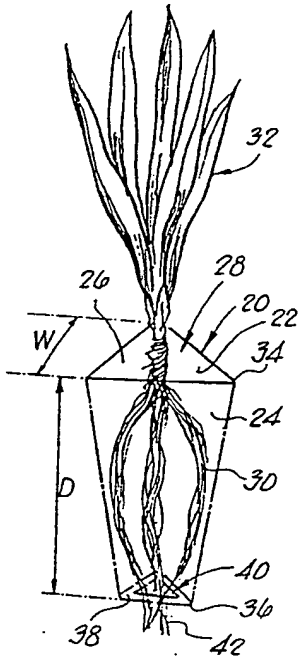

FIG.2

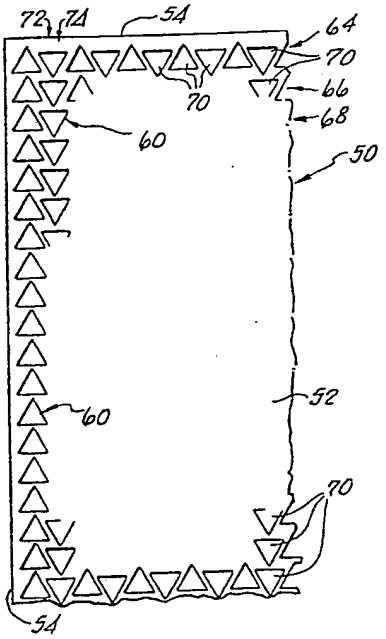

FIG.3

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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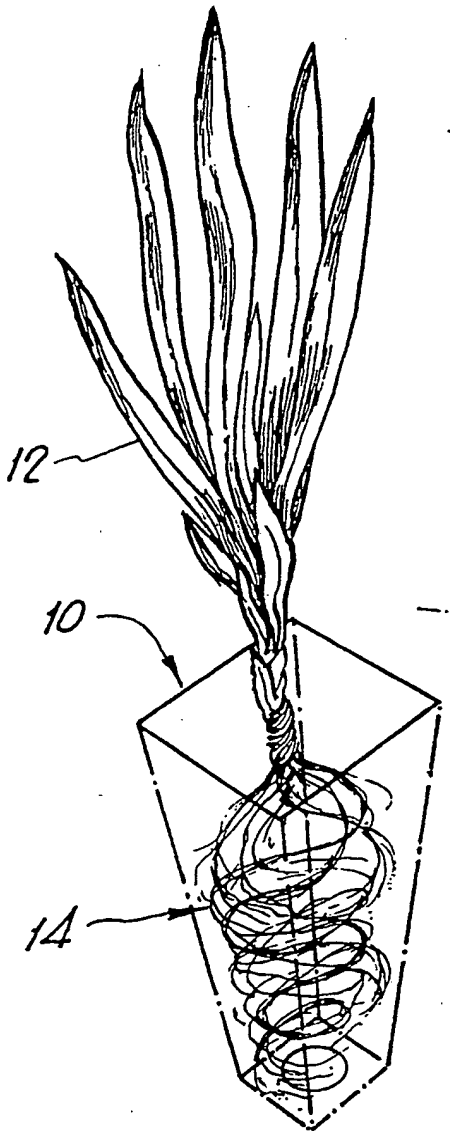

FIG.1

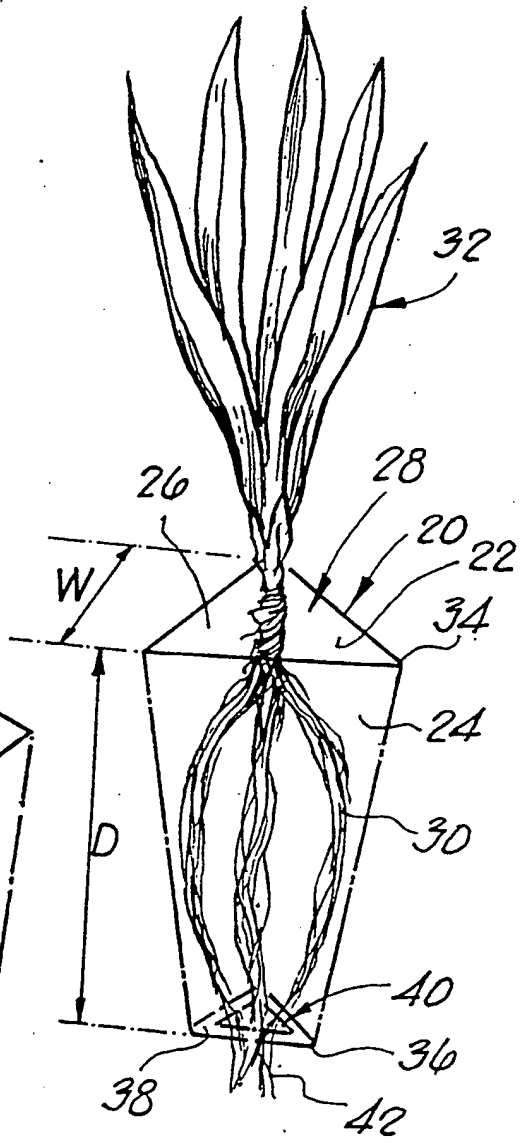

FIG.2

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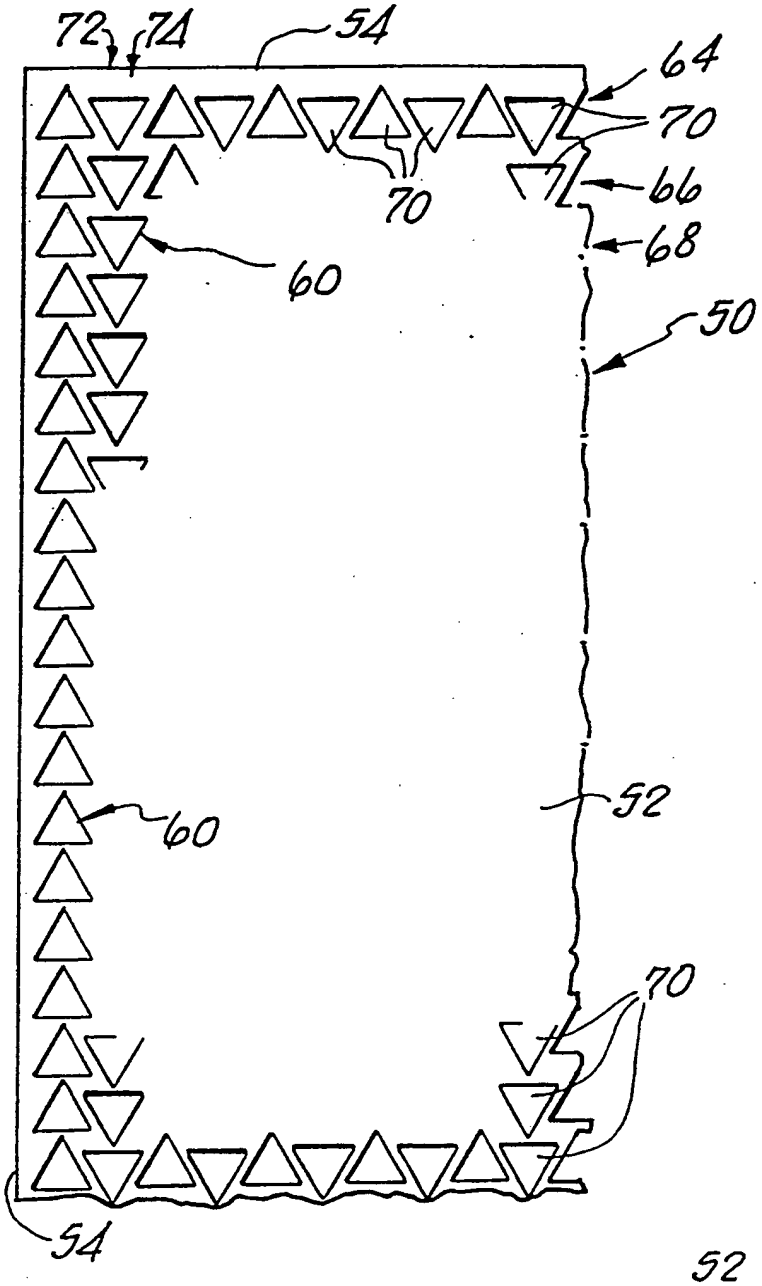

FIG.3

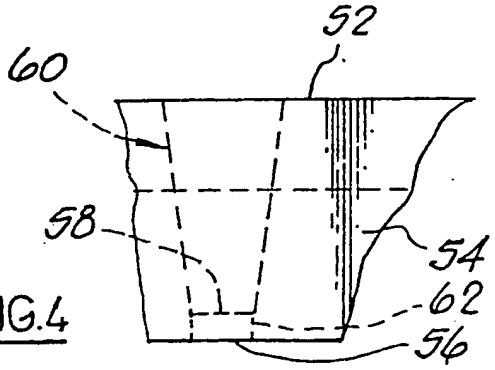

FIG.4

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PLANT CELLS

This invention relates to plant cells. More particularly, but not exclusively, the invention relates to propagation trays, for example such trays moulded in a plastics material, incorporating multiple plant cells. Such trays are used in horticulture and in agricultural/horticultural planting operations in which plant modules from such cells are planted in rows by a planting machine, for example of the kind disclosed in my co-pending European patent application EP 88309533.3. I hereby incorporate into the present application, as additional disclosure, the entire text of my aforesaid prior European application. Some aspects of the present invention may also find application in relation to individual plant cells to be utilised for horticultural purposes.

In horticulture, the use of propagation trays to grow transplants is becoming common practice. Each plant has its own individual cell. Plants grown by this technique are called modules. Previously proposed plant cells in propagation trays have been in the form of a cube. While this arrangement has the advantage of keeping each plant self-contained and avoiding the intertwining of the roots as occurs in traditional open tray methods of raising plants, nevertheless problems have arisen.

These problems relate to the tendency of the roots to form spirals and to become 'pot-bound'. Then, in addition, previously proposed trays have lacked adequate rigidity, Also there have been shortcomings in relation to proper spacing of the plants to achieve efficient light usage, design of the tray in relation to supporting same during use, and efficient use of the space and material of the tray.

An object of the present invention is to provide plant cells and propagation trays incorporating same, offering

improvements in relation to one or more of these matters, or improvements generally.

According to the invention there is provided a plant cell, and a tray of plant cells incorporating same, as defined in the accompanying claims.

In a preferred embodiment, a propagation tray is formed or moulded by conventional plastics industry techniques. Significant technical features of the tray include the generally triangular shape of the cell and the mechanical properties of the tray. A plan view of the tray shows the interlocking arrangement of the triangular cells. This is achieved by using the centre of each triangular cell, and arranging the centres on a straight line. To achieve the interlocking pattern, each successive cell is turned through 120 degrees with respect to its neighbour. The result of this arrangement is that surface rigidity is increased and spacing of the plants promotes more efficient light usage for growing purposes.

The cells taper downwardly, which facilitates removal of the module. The taper is slight, as it is an advantage to have root growth at the base of the cell. Because of the triangular form, the internal angles are only 60 degrees, as compared with 90 degrees for the prior proposal. It has been found that the plant roots are directed down the tight 60 degree corners, whereas in square and round plant cells, the roots tend to spiral which causes the plant to become pot bound, whereby the plant stops growing and is not able to produce new root fibres. What in effect happens, in the case of the triangular form cell, is that the roots are trained down to the bottom of the cell. At the bottom of the cell, to further inhibit the possibility of rootballing, the base of the cell is cut off. This facilitates the process of air pruning, a process by which the roots of a plant on exposure from the growing medium are dried by the air and shrivel up. This process is not harmful to the plant and

just encourages new growth further up the cell.

In the preferred embodiment, the triangular shape of the module has a distinct advantage in relation to mechanised planting, for example in a planter of the kind disclosed in my prior European application. This advantage derives from the fact that the previously proposed module shape, for example cuboid, can engage the coulter surfaces either in a parallel face-to-face manner, or in a corner-to-face manner on diagonally opposed corners of the module. This latter possibility usually results in the plant falling backwards or forwards. If, as usually happens, it falls backwards, it will be buried or misplanted when it is delivered into the soil. With the triangular form root ball, it is not possible for the root ball to engage the coulter on two opposite corners. Instead it will engage on one flat and one corner, thereby leaving the plant and root ball in an upright position.

Also in the preferred embodiment, the depth of the skirt of the propagation tray has been extended so to be as deep as the cells themselves, in this way, the previously mentioned rootpruning operation is promoted since the propagation trays are better supported and the tray is strengthened and its life and handling enhanced.

Embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:

Fig 1 shows, somewhat diagrammatically, a perspective view from above and one side of a plant cell containing a plant, the cell being constructed in accordance with previous proposals;

Fig 2 shows, in a view similar to Fig 1, a first embodiment of the present invention;

Fig 3 shows a plan view of a propagation tray containing plant cells according to the invention; and

Fig 4 shows a side elevation view of the tray of Fig 3 illustrating the depth and downwardly tapering profile of

one plant cell therein.

As shown in Fig 1, a previously proposed plant cell 10 is of generally square section profile as seen in plan view and a plant 12 growing therein has been found to tend to develop a spiralling root action as illustrated at 14, whereby the plant rapidly becomes pot bound.

Turning now to the embodiment of the invention in Fig 2, a plant cell 20 has walls 22, 24, 26 defining a space 28 to accommodate the roots 30 of a growing plant 32. The walls 22, 24, 26 define a generally triangular profile of the plant cell, as seen in plan view. The walls are generally flat and thus the cell is traingular at both its upper end 34 and at its lower end 36, the cell tapering in the downward direction with respect to its more normal upright attitude as shown in Fig 2. The ratio of the width W to the depth D (W/D) lies in the range 0.3 to 0.8 and preferably 0.5 to 0.6, where W is the width of the cell 20 at its upper end 34, and D is its vertical depth. As regards the degree of taper of the cells, the ratio of the width W of the cell at its top as compared with at its bottom lies in the range of 1.5 to 3.0.

The base of the seed cell may be entirely open, or formed with a narrow flange 38 defining a relatively large triangular base opening 40 through which the roots 30 extend at 42 and are thereby subject to air pruning, as previously mentioned.

Figs 3 and 4 show a propagation tray 50 which is moulded in plastic material and comprises an upper surface 52 and side skirts 54 extending downwardly from surface 52 at each side of the tray 50 and serving to support same in use. The lower edge 56 of the skirt may be at the same level as the bottom 58 of the individual cells 60 formed in the tray. Alternatively, the lower edge 56 may be slightly lower than the base of the cells, so that these latter are raised with respect to the surface on which the tray is resting. Each cell may have an internal flange

corresponding to flange 38, or may be entirely open, and may optionally be provided with a support flange 62 below the bottom 58 of the cell, whereby the cells themselves are directly supported. This latter factor is of significance in relation to those cells located in the central region of the tray 50.

The individual cells 60 are constructed as described above in relation to Fig 2. Fig 3 shows the arrangement of the cells in relation to the tray 50 as a whole. The cells are arranged in rows 64, 66, 68 etc. In Fig 3, only a illustrative number of cells have been actually shown, though it is to be understood that the entire tray surface is formed with cells. Successive cells in the rows 64, 66, 68 etc are laterally offset alternately one way and the other with respect to the longitudinal axis of the row. As also shown in Fig 3, successive cells 60 in, for example row 64, are arranged with one side 70 extending lengthwise of the row's longitudinal axis and that one side 70 is located alternately on one side and on the other of the centre line of the row, in successive cells.

Fig 3 also shows that the cells 60 are arranged in rows 72, 74 etc extending laterally with respect to the rows 64, 66 etc. The cells of the rows 72, 74 etc overlap as between one row and the next.

In use, plants are grown in the cells 60, the tray 50 is taken to a planting machine for planting operations. The operator removes plants successively from the cells and deposits them in the planting mechanism. The plants are readily removed by virtue of the tapering profile of the cells. The tendency for spiralling root action is reduced, and the propagation tray is stronger and better supported and is able to contain more plant cells than with previous proposals.

Amongst other modifications which could be made in the above embodiment while remaining within the scope of the invention are the following. Firstly, some divergence from

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Amongst other modifications which could be made in the above embodiment while remaining within the scope of the invention are the following. Firstly, some divergence from

exactly triangularity could be provided. For example, the corners of the cells could be more rounded, or could be squared-off. Moreover, the sides of the cells could be non-flat, for example concave or convex, preferably the former, as seen from the exterior of the cell. The cell could be defined in materials other than moulded plastic, particularly where automatic placement of plants in a planting machine is envisaged.

CLAIMS

1. A plant cell having wall means defining a space to accommodate the root of a growing plant or plants, characterised in that the profile of the cell as seen in plan view is generally triangular.

2 A plant cell according to claim 1 characterised in that said profile is that of an equilateral triangle.

3 A plant cell according to claim 1 or claim 2 characterised in that the profile of the cell as seen in plan view is generally triangular both at its upper and lower ends.

4 A plant cell according to any one of the preceding claims characterised in that the cell tapers in width in the downward direction, with respect to the normal upright attitude of the cell.

5 A plant cell according to claim 4 characterised in that the width to depth ratio of the cell lies in the range of 0.3 to 0.8 and preferably in the range 0.5 to 0.6.

6 A plant cell according to claim 4 or claim 5 characterised in that the ratio of the widths of the plant cell measured at the top and the bottom thereof lies in the range from 1.5 to 3.0.

7 A plant cell according to any one of the preceding claims characterised in that the base of the cell is largely open to permit roots to grow therethrough.

8 A plant cell substantially as described herein with reference to the accompanying drawings.

9 A tray of plant cells characterised in that said cells are as defined in any one of the preceding claims.

10 A tray according to claim 9 characterised in that said cells are arranged in rows with successive cells offset laterally alternately one way and the other with respect to the longitudinal axis of the row.

11 A tray according to claim 9 or claim 10 characterised in that successive cells in a row are arranged with one side of the triangle of the cell extending lengthwise of the longitudinal axis of the row, and said one side being located alternately on one side and the other of the centre line of the row, in successive cells in the row.

12 A tray according to claim 10 characterised in that said cell rows overlap as viewed longitudinally of the row.

13 A tray according to any one of claims10 to 12 characterised in that said cells are also arranged in rows extending laterally with respect to said first rows, the cells in one of said second rows overlapping with the cells of an adjacent one of said second rows.

14 A tray according to any one of claims 9 to 13 characterised in that the tray is formed as a plastic moulding and a downwardly extending skirt or flange is provided on at least two sides of the tray, the lower edges of said flanges being at the same level or lower than the bases of the cells.

15 A tray of plant cells substantially as described herein with reference to and as shown in the accompanying drawings.

16 A plant feed member for a planting machine comprising

a series of longitudinally spaced cells, characterised in that said cells are as defined in any one of claims 1 to 8.

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